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ABSTRACT

This paper discusses the link between technology and humanity and examines the possibility of using technology to transform man into a superintelligent species. The course of human development can be viewed as a consequence of technological development. If we can plot the course technology will take, then we can gain insight into the course humanity will take. The paper establishes the role technology has played in the past in defining humanity. Technology is using objects in the environment as tools. The personal attachment to or ownership of the tool so that it can be used again, the ability to improve the tool over its natural environment, and language and social institutions extending beyond the immediate family are examined. The technological world has been created and guided by man. If technology and humanity are linked, it should be possible to use technology effectively to direct change. Since natural evolution has been disrupted by technological man, technology appears to be the best approach to a revolutionary shift to higher intelligence. The means to knowing how to create a super intelligent species have been gradually determined with increasing technical sophistication during the last two centuries. These areas of potential breakthrough include technical intervention and brain enhancement, genetic engineering, genetic planning, artificial intelligence and contact with extraterrestrials. The consequences of super intelligence appear to be good and technological transformation should be accepted and allowed to proceed. (Author/RM)

Metaperspectives for the Future: Technology

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A B S T R A C T

The entire human experience is technological. There is an inextricable link between being human and using technology. Technology can be used as a perspective from which to view man. All human abstractions, whether philosophical, social, or physical ranging from ideas to institutions, are technologies.

Man's use of technology has created his world apart from the natural ecology. Study of the course of technological development leads to profound changes in the definition of humanity. As a forcing factor, technology has already radically altered natural evolution.

It appears that humankind is on the threshold of a transition to a higher order existence, super intelligence. We fear the consequences of super intelligence, but is is sorely needed as immense problems close in on us.

Since natural evolution has been disrupted by technological man, technology appears to be the best approach to a revolutionary shift to higher intelligence. Areas of potential breakthrough include technical intervention and brain enhancement, genetic engineering, genetic planning, artificial intelligence and contact with extraterrestrials.

The consequences of super intelligence appear to be good, and technological transformation should be accepted and allowed to proceed.

The Focus of Humanity

We are defined by our technology. Only man possesses, uses, and develops technology. It is technology that is proof of our intelligence, our humanity. Before technology, there were no humans. Technology is so much a part of our being that it has been taken for granted, overlooked, or thought of only in its physical manifestations--apart, base, necessary but relatively unimportant.

The fact that intelligence and technology are inextricably linked has been too long overlooked. This focus on the intellect of man apart from his technology has become the basis of the humanities disciplines. To those who practice in the humanities, the idea of technology is superfluous; higher order thinking by intelligent human beings should not require technology at all.[1] At some point, however, a few thinkers became aware of technology, not as an object employed by man but as an inextricable entity which had become so pervasive. Yet they often focused on technology as an autonomous thing, to be considered, perhaps to be feared.[2]

It may be more important to view technology as part and parcel of human existence, the collective baggage that humanity carries, only pervasive because man is pervasive.

Technology as a Metaperspective

If we focus upon technology as a primary determinant of human existence, then an interesting prospect presents itself.

The course of human development can be viewed as a consequence of technological development. If we can plot the course technology will take, then we can gain insight into the course humanity will take. We can use technology as a metaperspective on ourselves, perhaps our future.

To digress for a moment, it is important to establish the role technology plays in defining humanity. In its most primitive form, technology is using objects in the environment as tools. Using tools is not the sole domain of man. Certain birds and animals, most notably the primates, use sticks and stones as tools for gathering food and providing shelter. What is unique in the human use is not the mere tool use itself but the personal attachment to or ownership of the tool so that it can be retained and used again. The second unique thing about human tool use is the ability to improve the tool over its natural environment. The consequences of long-term tool improvement are staggering and have gradually, through innovation, led us to devices that for example, peer into the essence of the atom and the vastness of the Universe at will. If a device can be developed, it will.

Language is also a technology. Using his natural range of utterence, memory, and physical tools like the stylus and wet clay, man has created a technology of communication which has reached a point where it can survive on an electronic wave traveling at the speed of light through space, or be stored as magnetic fluctuations on silica apart from men's minds and retrieved at will. Abstract symbology, projected through the technology of language, has enabled us to capture and define

emotions, concepts, theories, and gods. In mathematical form, symbology has become the basis for human knowledge and given relativity to our physical experience in the natural world.

Social institutions extending beyond the immediate family are also technologies. In the beginning there were no schools, religions, governments, businessess, or any other social organizations. They all had to be abstracted by men, ever mindful of the natural human heritage.[3]

The importance of this discussion is that two worlds have been created: The natural world of geological upheaval and evolution by natural selection and reproduction and the manmade technological world created and guided by man. The technological world so permeates the modern human experience that human survival is almost entirely dependent upon technology. So revolutionary is the thrust of man's technology that its imprint is left on the land, sea, and sky. From the ionosphere to the poles to the depths of the sea, the hand of man has manipulated and created a difference. The world has been forever changed. There is no hope of reverting back to the virgin state.

Because of the pervasive nature of man's technological presence, many feel an impending ecological disaster coming from one of many forms ranging from nuclear holocaust to ozone layer destruction. However, if we take a technological metaperspective, it should be possible to shape, design, and build the type of future(s) we desire. When the first creature guarded a stick which gave it a feeding advantage, it could not contemplate going to the moon and walking about on it. We may be as far removed

from our potential as that creature, but just as the creature became human and created the human race with all of its pleasures and perils, so too we may be able to transform our world yet again, and ourselves in the process.

The Course of Technology

It is sufficient to say that before man there was no technology. In the course of the evolution of the Universe, technology has occupied but a small fraction of the timescale, perhaps about 3 to 4 million years compared with ten billion years estimated since its origin. There is every reason to believe that like life, technology is very common, and may be a means for measuring the scale of intelligence other than our own.[4]

Technological development has been gradual, resulting from billions of innovations, constantly being tested, sorted, and restricted. At first these developments take thousands of years to effect a breakthrough, then accomplishing Herculean feats in less than a decade. In many areas the course of technological development has shown itself to be exponential and quite predictable. The Twentieth Century has been perhaps the only time when profound technological changes could be observed in a single lifetime. A manmade world has been created. Technological forecasting for almost every technology has become an economic necessity. If we can project the course of individual technologies for economic purposes, perhaps we can put all technologies together and speculate the course a technological metaperspective may take.

The Stages of Technological Development

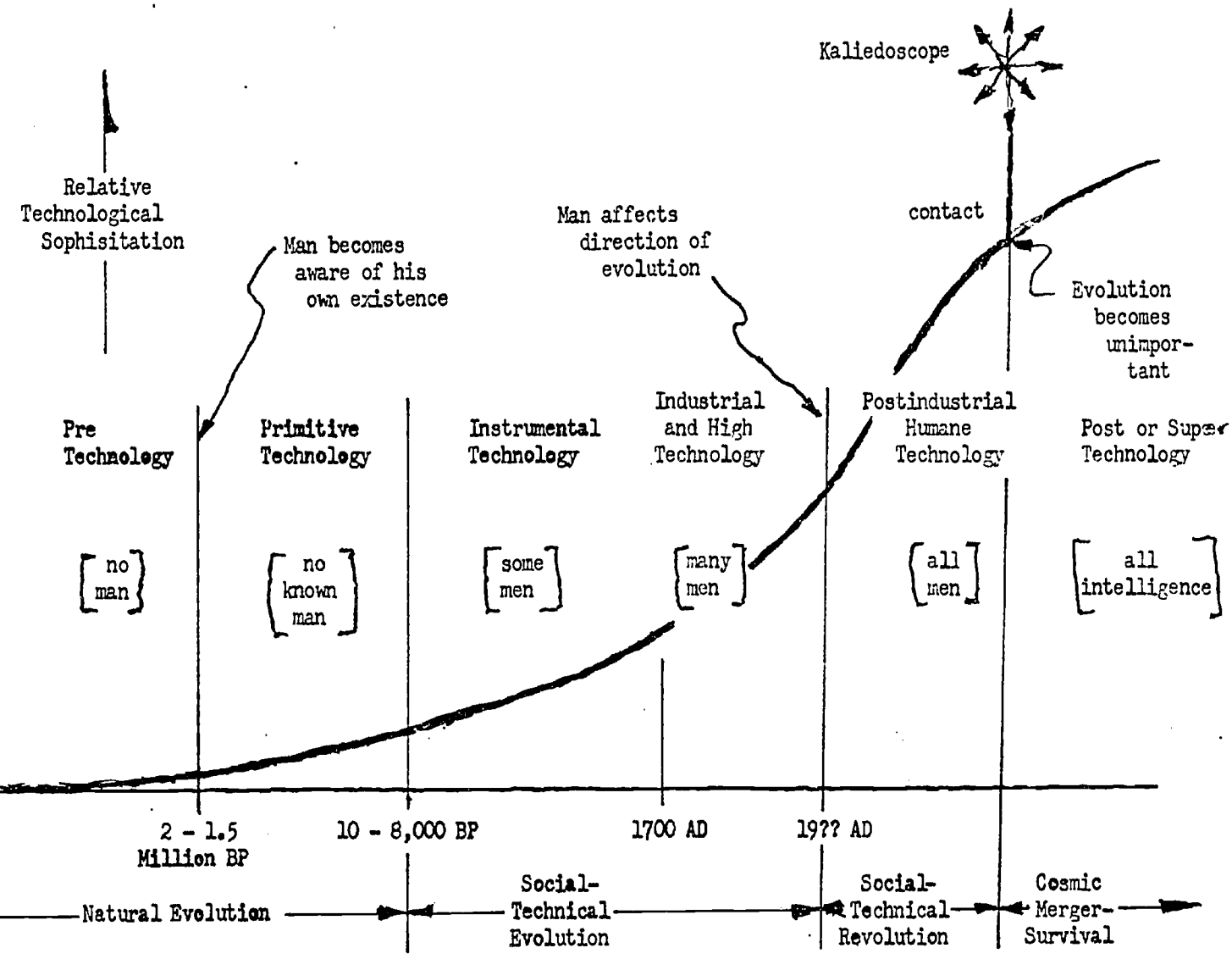
If we examine the course of technological development it is possible to locate demarcation or transition points where a change or shift in the technological milieu took place. Careful examination of the stages of the past makes it logically possible to speculate the direction and consequences of potential stages to come.

Figure 1 and Table 1 depict the known and future stages which can be discerned with present knowledge.

Table 1

Stages in Technological Development

Stage	Description
I. Pre Technology (to 1.5 million BP)	• Intelligent beings may have existed since 4 million BP. No evidence of tool use.
II. Primative Technology (to 10,000 BP)	• Evolution creates large-brained tool-using creature, Homo sapiens. Some men achieve greatness, but no evidence remains.
III. Instrumental Technology (to 1700 AD)	• Some men build civilizations and begin systematic institution-building and technological development. Course of evolution is altered.
IV. Industrial and High Technology (to 19?? AD)	• Many men rapidly alter environment and profoundly affect evolution. Knowledge based technology grow exponentially. Man becomes truly dominant species worldwide.
V. Post or Super Technology (unknown)	• Direct connection with other galactic intelligences. No known paradigm applies.



The Stages of Technological Development

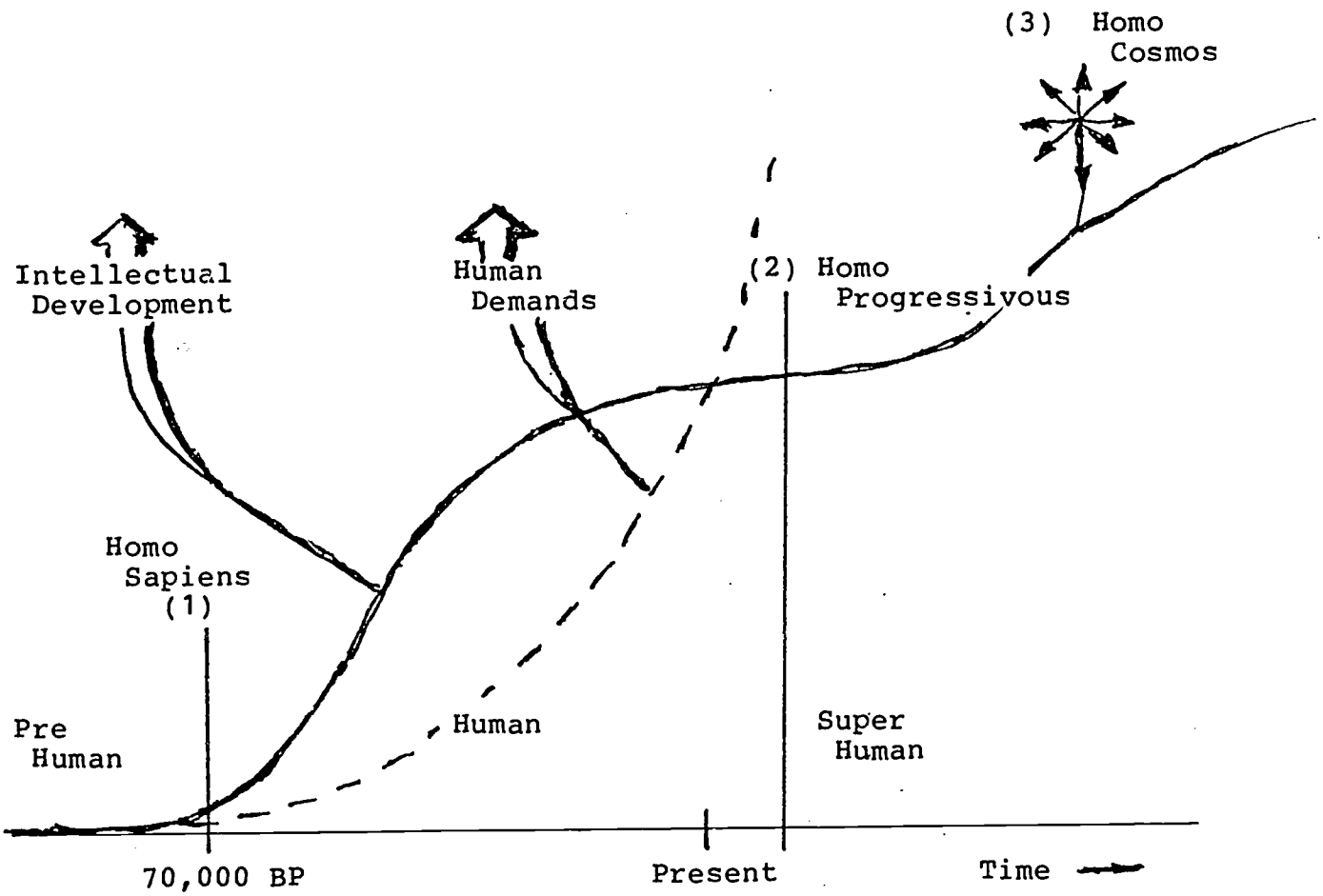
Figure 1

The Course of Humanity

If technology and humanity are linked, then it perhaps could be possible to use technology effectively to direct change. This done in sufficient quality could force a transformation of humanity. A number of theorists have speculated about a transformation of man into a superintelligent species, most notably, Pierre Teilhard de Chardin and Arthur C. Clarke.[5]

Deep inside, some of us fear the advent of superintelligence. We mostly claim that our time-honored values will be lost. We say that to err is human. Superhumans would not err, at least as we do. At the same time when exponential trends are outstripping our comprehension, we revert to values derived from pretechnological myths and ideals. The very thing that made us human, the natural ability to dream and create, is denied. In a rapidly changing techological world we have become slow and appear stupid unable to make accurate decisions in nanoseconds, unable to achieve ideals, unable to solve complex problems with simplistic approaches. We fear the power of super logic, yet we err and err and slide ever closer to the doomsayer's nightmare of Armegedon.

Figure 2 shows the essence of the problem. Our collective intellectual evolution has been strained by the course of events. It is gradually becoming unable to provide us with the mechanism for meeting our needs for water, food, shelter, security, and social identification. The last decade has been perhaps the first decade in history in which trends in favor of overall humanity were not positive.



The Course of Human Development

Figure 2

The Intellectual Dilemma

Because it invalidates our time-honored values, we hestitate to develop superhuman intellect. With super intellect, we lose control. If our values are so sacred, an inventory of our accomplishments (problems?) as humans is worth examining.

1. Unchecked population growth leading to a strain on the ecosystem and extinction of thousands of species.
2. Untold numbers of wars leading to millions of human deaths.
3. Inhuman treatment and early death to billions of people because of social, religios, racial, or cultural conflict.
4. Disruption and destruction of the ecosystem.
5. Extreme wealth and priviledge for some.

Great social experiments such as those fostered by theories of Democracy, Marxism, and Islam have failed to deter the above conditions, except in isolated situations. Hence our dilemma--we can't solve our problems with our intellect. It is very unlikely that a religious leader or alien spacecraft will arrive to change this situation. The fact that as Homo sapiens we are not smart enough, either individually or collectively, to solve these problems.

Intellectual Transformation

The important thing to realize is that natural evolution is nearly finished improving man as a species. The rules of natural selection and survival which made us thinkers no longer work well because we think and can create ways of maintaining life and reproduction in violation of the natural order which created us.

Once this point is fully understood, it becomes possible to speculate on the course a human transformation may take. The only logical course is not to become more socially, religiously, or physically equipped to deal with the problems, but rather to improve intellectual ability or capacity. Table 2 depicts the direction expected of intellectual transformation.

The Course of Intellectual Development

Stage	Description
I. Manlike ape (4 to 1.5 million BP)	. Natural evolution creates an upright, small-brained creature who hunts and gathers. Environment not used systematically.
II. *Apelike man (to 70,000 years BP)	. Natural evolution creates a large brained creature which uses environment in an effective way, using tools an social organization to advantage.
III. Man (Alpha) (to 19??)	. Natural evolution creates man the thinker (Homo sapiens) who conquers all other challenging creatures. Tool use is effective and alters natural evolution.
IV. *Super man (Omega) (19?? to ??)	. Universal man (Homo progressivous) will have solved earthly problems, be free of earth biosphere, and seek other intelligent life.
V. *Cosmic man (unknown)	. Homo cosmos will be a part of the galactic group of superintelligences which work together to solve problems on a galactic or intergalactic scale.

*Transformation points

Table 2

Technological "Forcing" Factors

The means to knowing how to create a super intelligent species (Stage IV) have been gradually determined with increasing technical sophistication during the last two centuries. It is likely that any one of these emerging technologies could effect a transformation in this century, before the technological support system maintaining the human population breaks down under the load. These technologies could force a breakthrough.

Areas of potential breakthrough include:

1. The use of chemical, electrical, or mechanical methods to enhance the performance of the brain and improve memory, logic or emotional behavior.

2. The use of chemicals or other means to recombine human DNA, reactivate dead or frozen tissue, clone, cells, or increase maximum lifespan potential.

3. The use of genetic planning to eliminate intelligence affecting disease, increase potential offspring intelligence, and enhance the methods above.

4. The devlopment of artifically intelligent or aware machines.

5. Contact with extraterrestrials.

Functional Enhancement

Developments in the first area of brain intervention are widespread and involve the least risk because they cannot be genetically inherited. Thousands of new drugs are being developed each month. Some like L-dopa have the remarkable ability to mitigate a debilitating disease like Parkinson's. Some like PRL-8-53, a memory enhancer, appear to enhance creativity, strength, endurance, or other behaviors.[6] Study of brain chemistry is rapidly unlocking secrets of how the brain works and

potentially how chemicals can be used to transform brain function.

Biomedical engineering is making rapid advances in electrical and mechanical devices to enhance human performance. Recent breakthroughs involve providing information to the brain for the visually and audiatorily impaired. The next stage will be to provide assistance to the favored of the population, as is already happening in competitive sports.

Of course the fact is that these methods and devices cannot be passed on by procreation. However, they may become so expensive and specialized that they will be inheritable and give advantage to the owners over those who do not have them.

Genetic Engineering

The second approach has dramatic potential for human transformation. Operating at the bacterial level with relatively simple DNA like that of the bacterium, E. coli, Scientists have already developed new life forms. As Nobel laureate Hamilton O. Smith has written, "[C]onstruction of recombinant DNA ... together with the concept of molecular cloning, has given birth to the new field of genetic engineering."[7] It is only a matter of time before human DNA will be the object of recombinant research. Beginning with the painstaking removal of known code defects on the DNA of parent sperm and ovum, the work will eventually progress to improving the offspring of those now considered "normal".

On June 16, 1980, the United States Supreme Court ruled that a patent could be granted for a new microorganism created by

recombinant work. Patenting life forms could hasten development of the field of genetic engineering.

Cloning is already widely practiced in work with primative life forms like bacteria and viruses, and there is evidence that it may have been accomplished with reptiles and rodents. Like DNA recombination, it is only a matter of time before human cells will be cloned.

As more is learned about genetic structures, it may be possible to reconstruct genetic codes long dead in cellular structure, revive frozen cells and clone them, and reverse or arrest the aging process in cells.

Genetic Planning

Genetic planning is very old and the basis for most religious marriage practices such as taboos against intratribal marriage and incest. In animals, the practice dates back to the first domestication of wild animals about 10,000 years ago and today has become the basis for food production from fruit to grains. The sinister implications of some plans for genetic control in humans has slowed progress, but modern acceptance of contraception, abortion, and other birth control practices in the face of a burgeoning world population all contribute to the increasing acceptance of the concept of planning birth.

The World Health Organization has found that malnutrition-induced retardation may be transmitted to offspring in over-populated Central American countries. On the other hand, Sheldon Reed found that parents with high IQs on the average have more children than those with lower IQs.[8] Whichever trend the

human gene pool is taking, planning can affect these trends.

Recently sperm banks have been opened to assist couples unable to conceive. One sperm bank in California delcared as its objective to use the sperm of geniuses and Nobel laureates to impregnate women of high IQ and accomplishment. Since this experiment is a business and is fully understood and chosen by the participants, it does not constitute planning so much as an opportunity--an opportunity for highly intelligent people to increase their chances of having (more) intelligent offspring.

In fact, doctors, often with the confidence of their patients, have been practicing genetic planning through counseling and actions such as abortion for a very long time.

Artificial Intelligence

Artificial intelligence is removed from the realm of creating a higher order human species. Nonetheless such a creation would constitute a transformation of humans because of what this intelligence could do to lead us through our dilemmas. It is unlikely that electronic digital computers will ever approach awareness because of the limitations of the binary logic required for their operation. Chemically sensitive analog devices show the best promise because they most closely approximate the neuron, the source of awareness in living things.

The complexity of achieving artificial awareness does not make it impossible but it may require superhuman intelligence to achieve it. DNA recombination and genetic planning seems more likely to achieve a transformation, but accidential circumstances may create aware machines in spite of our ignorance of how they may work.

Extraterrestrial Contact

There are two ways intelligent life in other parts of our Universe can come in contact with us: they can find us or we can find them. Based on our laws of physics and probability and knowledge of the Universe, the chances of them happening upon us are perhaps one in a million. Because of our limited technology, the chances of us contacting them are probably less. In spite of the odds, any contact would result in an almost immediate transformation, perhaps one order removed from the others previously discussed (beyond Homo progressivous to Homo cosmos).

A group of astronomers and physicists have formed an organization called SETI (for Search for Extraterrestrial Intelligence) and developed elaborate methods for radio contact. There is no known strategy for extraterrestrials contacting us.

If contact is achieved, the effect would be immediate and profound. I have chosen to call this the "kaliedoscope" effect because like the colors of the kaliedoscope the most effective way to communicate with our brains would be through all of our senses at once.[9] Since the brain's visual cortex is the largest, the impact would probably be multicolored and last as long as it would take for our brains to "learn" the information communicated. If the memory process of the brain is a kind of DNA/RNA holographic image as theorized by Karl Pribram, the kaliedoscopic "brainwashing" seems very plausible.[10]

Another aspect of the kaliedoscope effect is that a superior intelligence capable of reaching us across the vast distances between the stars would probably communicate with all the humans

on the earth at the same time. The transformation to Homo comos would be equal for all.

After the Transformation

But we can't wait for aliens to transform us to super intelligence and cosmic contact. We have the technology to assist our own transformation. Whether or not we have the courage to do it we probably will.

We can speculate on some of the implications of super intelligence. They have been alluded to the figures and tables:

1. A society with better technology rather than more technology. This technology would:
    a. not wear out,
    b. be energy independent,
    c. not damage the ecology,
    d. require no maintenance, and
    e. not be "owned," but be for all to use.
3. A society where no one would fight for survival because species survival would be assured and not be a driving force.
4. Individual differences would be increased and valued. Multiple societal goals would be pursued. Hatred, misery, and war would not exist.
5. Much of the population would live in space, leaving vast areas of the planet to return to natural evolution or ever more diverse life forms.

If these results seems unrealistic the so be it. But it is difficult, if not unreasonable, to expect that a major transformation of human intelligence would lead to acceleration of the horror and misery that has characterized the reign of Homo sapiens. All problems would not be solved by a transformation,

but the order of problems would be higher. Just as high technology would beget higher technology, solving earthly problems would lead to presentation of cosmic ones such as the transition to a new energy source after the sun dies.

Notes

1. In his essay, The Two Cultures and the Scientific Revolution (Cambridge University Press, 1959) C.P. Snow pointed out how far removed from the reality of the technological world the humanities disciplines had become.

2. Henry Adams, upon viewing the giant dynamo being displayed at the 1900 Chicago exhibition observed that its power was massive and awesome. He wrote about it in his classic book, Education. For a most provocative discussion on the subject read Heilbroner, Robert L. The Historical Debate. Chapter 1 in Automation and Technological Change.

3. Herbert Spencer extended Darwin's theory in his Principles of Sociology (New York: Appleton, 1896-99) to encompass human organizations. Robert Ardrey, in his The Territorial Impertative (New York: Atheneum, 1966) reminded us that our natural evolutionary heritage affects our ability to design human organizations.

4. For a good discussion of this see a dialogue between Arthur C. Clarke and Alan Watts. At the Interface: Technology and Mysticism. Playboy. 19:944+, January, 1972. It was proposed that extraterrestrial civilizations could be scaled by the amount of energy they consume.

5. See Theilhard de Chardin, Pierre. Translated by Bernard Wall. The Phenomonen of Man. New York: French and Eur, 1959. [1955]. Clarke also proposed a human transformation in the screenplay, A Space Odyssey: 2001.

6. Hansl, Nikolaus R. and Adele B. Learning and Memory Improvement Through Chemistry: Dream or Reality in the Offing? Phi Delta Kappan. 264-65, December, 1979.

7. Smith, Hamilton O. Nucleotide Sequence Specificity of Restriction Endonucleases. Science 205:455, August 3, 1979.

8. Reed, Sheldon C. The Evolution of Human Intelligence, p. 291.

9. This effect was first described in an unpublished paper, "Technology in the Future: The Opening Window," prepared at West Virginia University in August, 1977.

10. The idea of a holographic theory of memory was developed by Pribram in the late 1960s after research on the physical/chemical properities of monkey brains. He presented his theory in 1979 at the 145th meeting of the AAAS in Houston.